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ABSTRACT

A worldwide international computer network, called the Intercultural Learning Network, has been developed to provide students from different cultures with opportunities to work cooperatively. Prototype activities have been developed and tested which facilitate and contextualize interactions among secondary and college students. Joint projects in language, science, and social studies are carried out using an overnight electronic network to coordinate parallel surveys and to exchange findings of joint research. Five important questions are addressed in this research: (1) Is the Intercultural Learning Network technically feasible? (2) Is it economically feasible? (3) Is it useful for instructional purposes? (4) What organizational structures are required? and (5) Can the system support multiple languages and cultures? Findings indicate that because of continuing technological advances, cross cultural activities have become economically and technically feasible. The level of technical expertise needed is reasonably accessible to any motivated teacher. The continuing costs involved are small enough to be covered as incidental expenses by many school budgets. The educational potential of the activities is promising. Some prototype activities have been developed to facilitate the initial interactions across cultures. Joint participation in such activities is a good way to encourage multilingualism and awareness of other cultures. Further research is being conducted to evaluate the long term effects of international networking on students' attitudes, knowledge, and cultural awareness. (12 references) (Author/GL)

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Interactive Technology Laboratory

Report #8

A Worldwide Intercultural Network: Exploring electronic messaging for instruction

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Abstract

A worldwide international computer network has been developed to provide students from different cultures with opportunities to work cooperatively. Prototype activities have been developed and tested which facilitate and contextualize interactions among secondary and college students. Joint projects in language, science and social studies are carried out using an overnight electronic network to coordinate parallel surveys and to exchange findings of joint research. The instructional utility of these activities and the technical and organizational aspects of the network are discussed. "Receiving-end translation" as a method for achieving understanding across languages is reported.

A Worldwide Intercultural Network:
Exploring electronic messaging for instruction

Technological advances in communications and computers make physical distances less of a barrier to intercultural cooperation. Developments over the last decade allow people to communicate across great distances at rapid speeds; masses of information can be reproduced and distributed simultaneously throughout the world; knowledge resources can be shared and interactions enriched by people who may never meet face to face. These technological advances also enable people to respond and pose questions directly to others around the world and conduct personalized interactions about topics of mutual interest (Kiesler, Siegel & McGuire, 1984; Collins, 1985).

International educational networking through electronic message systems can provide a powerful new medium for education. Electronic networking is qualitatively different from other instructional technologies, which are either more expensive (direct phone calls), constraining (telex) or extremely slow (regular mail). The regular mail system is not particularly suitable for educational activities because its turn-around time is too long. Telephone use is costly and poses time-zone inconveniences. It also requires a significant level of language fluency due to the real time demands of the medium for immediate response. By comparison, non-real time electronic messaging offers greater time for interpreting messages and creating responses (Black, Levin, Mehan & Quinn, 1983). Message can be prepared in advance on a microcomputer and quickly transmitted across telephone lines. It is these characteristics of

electronic mail which offer the potential for creating a new environment for learning across cultures.

This paper describes an international computer network, called the Intercultural Learning Network, that has been developed to provide students from different cultures the opportunity to work with one another in educational activities. Through the description of this network, we will address five important questions:

Is it technically possible?

Is it economically feasible?

Is it useful for instructional purposes?

What organizational structures are required?

Can the system support multiple languages and cultures?

The Intercultural Learning Network is an attempt to create "functional learning environments" for the study of social and natural sciences, local and foreign language literacy and intercultural problem solving. A functional learning environment is a well defined context that focuses learners' attention and motivates learning and performance on tasks instrumental to the achievement of explicit goals. These contexts can be real or simulated settings that operate as models of larger, more complicated or more diffuse realities. In a functional learning

environment, students are motivated to achieve their goals and they see the instrumentality of the task to achieve these goals. The formulation of the goal need not be originated by the student but it must be accepted as something the student wants to achieve. The idea of the functional learning environment is based on the assumption that the most powerful learning occurs in a situation where the learners are aware of what should be learned, how, and for what purpose. Functional learning environments do not necessarily use computers, although computers may facilitate the creation of such environments (Riel, 1985; Mehan, Moll & Riel, 1985; Newman, 1984; LCHC, 1982).

Other theoretical support for these networking activities comes from recent research on joint problem solving. Miyake (1985) found that people confronting a complex cognitive task were more successful when they divided the task. "Doers" focused on the details of the task while "monitors" supervised the overall strategy. This division of labor led to efficient solution of the task. It has also been shown that incorporating more than one point of veiw into a task situation has a unique value of helping the participants gain better understanding (Inagaki & Hatano, 1983; Miyake, 1985). The activities of the Intercultural Learning Network are promising attempts to bring together vastly different viewpoints (based on cultural differences) into instructional settings.

The Technical Feasibility of Intercultural Networks

Our initial concern in creating the Intercultural Learning Network was related to the technological and economic feasibility of establishing

and maintaining a regular flow of communication across cultures.

During the spring of 1984, a series of pilot activities established the feasibility of such networks. These projects were carried out in Tijuana (Baja California, Mexico), San Diego (California, USA) and Juneau (Alaska, USA). In this pilot study secondary school students participated in various activities such as news reporting, joint social science surveys and crosscultural simulation games (Cohen, Levin & Riel, 1985).

Since that pilot study established the feasibility of education by networking, the number of sites in the network has been expanded. Students in Tokyo Japan, Jerusalem Israel and additional sites in the United States began to participate in the network during the fall of 1984. Three courses were established at the college level in Tokyo, Jerusalem, and San Diego exploring directly the educational potential of this network. University students participated in the design and implementation of various activities and provided support for the participating secondary school students. Other sites in Tijuana Mexico, Madrid Spain and Juneau US joined the network during the spring of 1985.

Israel was incorporated into the network at the university and secondary school levels. At the Hebrew University, students participated in a year long course titled "Computers in Education" offered by the first author. During this course, students were introduced to the Intercultural Learning Network and were invited to design and carry out projects within this framework. At the secondary school level, students participated in the network activities during within their regular English class and in

voluntary after-school activities coordinated by the university students.

Japan was incorporated into the intercultural network through a year-and-a-half seminar class at the Aoyama Gakuin Woman's Junior College given by the second author. The theme of the seminar was "English learning environments: From the view point of functionally using the language." The specific aim of the project in Japan was the creation of a functional learning environment for Japanese students to learn the English language through actual communication with students in other countries with whom they were collaborating in joint research.

The Israeli students' first reaction to the notion of networking was disbelief; they doubted the technological feasibility of such a project. Since an airmail letter from Israel to the US may take up to 2 or 3 weeks, and since some households in Israel wait more than five years to have a telephone installed, it is not difficult to understand the students' attitude. These concerns dissipated during the first week in which they participated in the regular flow of message exchanges with Japan and the United States.

In Japan, where fairly reliable mail and telephone services are available, the technology itself did not surprise the students. Still, some students felt perplexed because it was hard for them to understand how this communication actually took place. Like the Israeli students, their concern or curiosity decreased as the flow of messages increased. However, Japanese students had to face another technical problem, which could be unique to them. Because of the nature of the Japanese language, which uses a very large number of different characters, typewriters are

not commonly used in Japan. Therefore none of the students were capable typists when they started. After three months of exposure, they were still slow but had started to feel more comfortable using the keyboard.

The Economic Feasibility of Intercultural Networks

The basic cost for computerized communication from Israel to any place in the world at peak hours is more or less as the cost of a regular phone call between Jerusalem and Tel-Aviv (which are 40 miles apart). In Japan, an international computer message linkage currently costs about one-fifth of the overseas long distance telephone communication. Tijuana is connected to the network through a local call across the border to San Diego. Within the US it takes a local call to connect to a commercial network service which provide electronic mail for less than ten dollars per hour (during evenings and weekends). Preparing the messages beforehand on a computer disk and sending them automatically at low-rate hours enables schools to participate in such networks at reasonable cost.

The Educational Utility of Intercultural Networks

The activities in the Intercultural Learning Network provide good examples of the range of activities possible in instructional networks. In this section, we describe these activities and the effect each had on the participants.

Direct Cultural Exploration

In both Israel and Japan, students learned how to use computers for creating, sending, and receiving messages. During ther first exchanges across the network, students introduced themselves and their sites, establishing a basis for further, more substantial exchanges. They exchanged messages about their backgrounds and interests. Many of the students said that they were highly motivated by responses received bearing their names.

Toward the end of the first month students at Tokyo initiated a simple questionnaire which surveyed the knowledge of Japan that students in other sites had. The general pattern of the results showed that students elsewhere knew less about Japan than expected. For example, a question asked to list the names of Japanese political figures, novelists, movie stars, singers, designers, or others. One U.S. student, instead of answering, honestly commented that the question itself made him realize how little he knew about Japan. This finding motivated the Japanese to continue. They began preparations for "joint research" projects. Students worked out themes for joint research at each site, and then exchanged ideas about research topics and research methods cross-culturally. Based on these interactions, several joint projects was developed and executed.

One type of spontaneous activity consisted of direct queries among the students about cultural issues. Students sent messages requesting information about specific aspects of each other's lives and customs. Many exchanges focused also on gathering opinions about their own culture as seen by people in the other sites: students in the US were interested in

the impact that certain types of American music had on other cultures. Students in Japan were interested in how Japanese people and customs are perceived by American students compared to perceptions of Chinese people.

Some of the messages remained unanswered, some got only vague responses while others motivated a large number of students to respond. This difference seems to be related to the generality of the query, as well as to the amount and accuracy of the prior knowledge that the questioning student had. The following message is an example which did not arouse much interest from the Israeli student addressed:

> Dear N:
> A while ago you mentioned that you are from a kibbutz in the North. I am really interested to learn what life is like within the community. What are the common daily activities among the members? I imagine that your home is different than the society of the university. Could you tell me about the differences of each place and how you feel for them?

Student N commented to Cohen that the message asked for a comprehensive response requiring "too much effort." By contrast, the following is an excerpt from a message, based on information from a Japanese encyclopedia, which received a comprehensive response from Israeli students:

To Israel:

Hello! We have investigated some materials about your country in the encyclopedia. We'd like to send this to you and we have some questions about you....

Daily life in Israel is regulated by the commandment. Worship, gala, and meal etc privails by the precept described in the Old Testament.... Religios gala day is a national one. It is fixed by the Jewish calendar. (Q:2 What is "Jewish calendar? Do you use it now? If not what do you use?) When boys and girs grow up to 13 years ols, they are regardad as religious grown-ups and given the Old Testament. (Q:3 Who give the Old Testament to them?) In kibbutz near the frontier they are given rifle with it to protect their village. During gala day they eat vegetable diet. They don't eat unclean animals (horses, cats, pigs, camel), lobster,crab, shellfish. (Q:4 what is "vegetable diet" in your country?) (Q:5 Do you eat cats in your common diet?) It is prohibited to cook meat with milk... (Q:7 Do everybody follow regulations in the gala day?)

The responding students appreciated the effort made by the Japanese students to learn about Israel. They understood the misunderstandings and prepared an extensive response which was received with interest in Japan.

The learning process embedded in these interactions should be contrasted with conventional social science classes in which students read

about other cultures. The cultural descriptions depicted in Social Science textbooks often focus in cultural idiosyncracies which become stereotypical. In the Intercultural Network, students contrast the information gathered from textbooks with the incoming information from real representatives of other cultures. We hypothesize that the resulting integration of cultural information is more authentic and better understood than that achieved by conventional instruction. Systematic evaluation of these and other aspects of the network is currently being conducted.

The mutual cultural exploration and the concurrent need to understand one's own culture in order to correspond adequately have been natural developments in the Intercultural Network. The cultural interest arose spontaneously from the beginning of the project and has increased ever since. The authenticity and directedness of the interactions creates a functional learning environment for the study of others, and one's own culture.

The following sections describe the instructional activities in three areas: writing, science & social science and second language learning.

Writing for an international students' news network.

Riel, Levin, Rowe & Boruta (1985) developed a students' news network based on electronic communication. We incorporated a version of this activity in the Intercultural Learning Network. Students wrote news articles (in English and Spanish) and sent them overnight using the electronic network. The articles were translated by bilingual students or

used as real life exercises in foreign language classes at the receiving end. In these articles students described aspects of their life, opinions, reviews, etc. to students in the other sites. In this way their writing took on a purpose different from teacher's evaluation and was directed to a real audience composed of peers. As a result, their writing became functional -- directed at a communicative goal.

The following article written by two high school students in Jerusalem is an example of functional writing. Its authenticity reflects the students' involvement in their writing tasks. It starts with objective statements and gradually becomes very subjective and intimate with the reader:

January 14 1985

"Wars are stupid and people are stupid..." The life in Israel isn't very easy,people here have to face many problems and one of them is war. We live under the pressure of war which became a part of our daily life. We hear about it on the radio, it's mentioned on T.V. all the time, we see our parents worried and people are generally nervous.Even if we're not, in war,we have to be aware of enemies who want to hurt us in different ways.When we are in war , we are worried about our dears (fathers, brothers,boyfriends etc.) In spite of this we like our country and appreciate the good things it offers us.For example the fact that it's our land! The country is also very beautiful and interesting.SO COME AND VISIT US SOON!!!

By,By,by from Israel Simona & Monci...!

The student's news network is the best existing prototype of a functional learning environment encapsulated in a network. The tasks (writing, translating and editing articles) were motivating for the students: their functionality was understood by them. The tasks were instrumental for a goal they wanted to achieve. They accepted the task although it was explicitly made clear that writing articles was to be done on a voluntary basis. Some of the students asked for "permission" to write about more than one topic. The articles were written individually or in pairs, and the students knew there was no guarantee that their articles would be included in any version of the Computer Chronicles newspapers in the various sites.

The same applies for the translation of incoming articles: students volunteered to translate articles from English or Spanish. The volunteers were not necessarily bilingual or the high achieving students. It was simply accepted by everyone that Mexican students would write in Spanish and the American students would write in English. The Japanese and Israeli students wrote in English since their participation was framed by English as a second language classes. The need to translate between languages was perceived as functional by the students and supported their publishing goal. The revision and editing of articles have been found to be instrumental in achieving higher quality composition in newspaper and expository writing (Miller-Souviney, 1985). The Computer Chronicles thus served as a functional learning environment for literacy in both local and foreign languages.

Joint research projects in science and social science.

The Intercultural Learning Network enables students of natural and social sciences to study such varied fields as ecological systems, astronomy, geographical phenomena and public health habits (Levin & Cohen, 1985). The range in areas of knowledge studied is limited only by the interest of the students who research and report their local knowledge. The exchange and the comparison of data from distant sites encourages students to develop adequate methods of information gathering and reporting -- in itself a valuable instructional factor and an integral aim of the Intercultural Network.

The social science inquiry projects have become the framework for numerous initiatives designed by college students. The following projects aroused wide participation in the various sites.

Educational systems comparison. Each site collected data from college and high school students concerning their feelings about school: the role of schooling, what students should expect to get out of school, how to improve schooling, and what they could learn from other cultures to make their own schools better. Each site had slightly different focused interests in what they wished to compare, which made it necessary for them to discuss and negotiate how to develop the research itself.

The topic of this project was so tightly related to the students daily life that they often spent a lot of time discussing the topic locally, leaving less time for cultural exchanges. Yet some comparisons were made and some patterns of cultural difference emerged. One U.S.

student noticed that while Japanese students tended to regard their college life as freer than their "high-school days," the US students felt the opposite about their American colleges. This comparison made Japanese students re-think their stereotypic conception that Japanese colleges are harder to enter. Since US students have to strive for graduation while Japanese students are almost guaranteed success once they are admitted, the simple judgment of which system is more difficult cannot be and should not be made based on the admission procedure alone.

News comparison. Each site collected international news from the morning editions of a widely subscribed local newspaper for a specified period of time. They exchanged the headlines (translated) and looked for patterns in the manner in which other cultures were presented in their own and other nations. Each group then published their analysis. Topics which aroused special interest in one of the sites, i.e. the 40th aniversary of the end of World War II, were documented by the other sites as well.

From these analyses students at each site learned that there were few overlaps in the news published as "international" at different sites. This activity not only helped the students learn more deeply about topics of concern but it also provided them with a good opportunity to think about more theoretical issues of what pieces of information are reported as "news."

Cross-cultural and cross-generational comparions of careers. At each site students collected data using a simple questionnaire asking about their careers and career expectations of their peers, their parents,

and their grandparents. By exchanging and comparing data from different sites, students looked for a pattern of change in women's feelings toward careers.

In essence, the students in this group found two trends: older people had more realistic career expectations, and the U.S. students had a wider range of expectations than either Japanese, Mexican, or Israeli students. To some extent, the pattern of cultural differences confirmed the students' pre-conceptions. Yet one item of comparison was strongly enough to surprise students: On a question asking about how long they would wish to continue their choice of job, many U.S. students answered "until I get bored," while none of the Japanese students based their answers on personal preference like boredom; Japanese students always assumed external circumstances would affect their decision.

Natural science inquiry. University students in Jerusalem prepared projects in natural science including comparisons of the crosscultural distribution of genetic traits such as the ability to roll one's tongue, measurements of the concentration of oxygen found in the blood of people living in different altitudes and explorations of the background conditions which affect chemical reactions at different localities (differences in humidity, temperature, air composition, altitude, and so on). A Japanese elementary school teacher proposed to take advantage of the large distances between the sites to perform a coordinated measurement of the distance from the earth to the moon. Students in San Diego have suggested examining dietary differences across countries and cultures. The search for topics and experiments that would yield interesting results, given the sites who participate in the network,

itself became a motivating educational activity.

Cross-cultural simulation games. The instructional network was also used to create international teams which played against each other in a cross-cultural simulation game. The game began with all groups being presented with a common problem solving task. Each team, consisting of members from different sites (Juneau, San Diego and Tijuana), was given a limited period of time to develop and submit a plan of action. Subsequently, each team was informed of the decisions and moves of the other teams. Thus, the process became one of developing strategies and reacting to changing conditions. Since the members of each group belonged to different countries, decisions and actions had to be coordinated using the message system, thereby bridging cultural and geographical boundaries.

The simulation game presented students with two competing bicycle companies. The two task teams (the "Yellow Co." and the "Green Co.") had to develop and execute company policy which would enable them to beat the competition. Students who participated in the project enjoyed the experience and were motivated to continue the game over an extended period of time. It seems possible that simulation games and other problem solving activities can be designed which effectively engage students from various cultures in a functional learning environment over extended periods of time.

A functional learning environment for learning a second language.

The Intercultural Network has been utilized to create a functional learning environment for English as a second language in Japan, where the instruction of the functional aspects of the English language -its usage as a communicative tool- has long been neglected. Two reasons could account for this neglect. First, the emphasis in teaching English in Japan has been skewed toward "correctness." Thus, most teaching focuses on 'easy-to-evaluate' aspects of the language, such as its vocabulary, syntax, and orthography. The teaching of communicative skills, such as "assessing what to communicate," "expressing clearly so that others can understand," "requesting clarification when being uncertain," has not been stressed. The second reason for the neglect involves the opportunity for usage. When a language is not used daily, it is difficult to encourage learners to use it as a living language.

Before entering college, Japanese students have studied English in school for more than six years, starting at around age 12. They have had basic knowledge of the grammar and basic vocabulary of three to five thousand words. Yet students feel they can not "use" the language for communication.

Twelve college students in the second author's class participated in the Intercultural Network. The overall goal of the class was to experience networking and to develop useful ways to employ it for teaching English. Throughout the course, Japanese students were encouraged to work out concrete projects of interest, both with their peers and with students from other sites. They were encouraged to use English functionally to

pursue their own research goals, not just to "practice" English for its own sake.

English was not the object of learning in this situation: the aim of their activities was to accomplish an international joint research using the English language. The sources of their language learning were (1) group teaching and learning from other group members, (2) assistance, which was available on demand from the instructor or her research assistant, (3) messages from other sites and (4) feedback given in the forms of responses and/or questions from other sites.

The first effect we noticed was that these research activities increased students' motivation to use English. A comparison of pre- and post-tests show that they also gained in their command of English through these activities. On one set of tests, where they were asked to translate Japanese expressions commonly used in messaging into English sentences of equivalent meanings, the average success rate of the translation increased from 64.1% on the pretest to 74.6% on the posttest.

Discussions with students suggest that all the students felt that they used English for communication in this class. English was used not for doing class assignments but for exchanging ideas with other English speaking people. While they sometimes complained that they felt as if they were trying to accomplish two goals at the same time (research and language development), all students agreed that they were communicating and that their research was progressing, the latter to lesser degree than they wished. One student commented that her English expressions could be

more concise than using Japanese sentences because when using English she was forced to work harder. This comment reflected their attitude toward English: the language is regarded as a tool for communication. All the students agreed that the English they used for networking was a living language, while the English they had learned up to their high schools was something else, a school subject, which required a large amount of drill and practice to be successful in exams. These students' comments indicate that their involvement in the Intercultural Network formed a functional learning environment for them.

Educational Utility: Summary.

The potential value of international educational networking seems very extensive. It opens the opportunity for using the world as an instructional laboratory for language arts, foreign language, science and social science, in which students can study such varied subjects as expository writing, cultural traditions, astronomical and geographical phenomena, dietary practices and public health habits. These topics become tangible subjects of study when students interact from one site to another. The purposeful use of foreign and local language as well as systematic methods for gathering and reporting findings become a real-life necessity for the students when comparing the data from different locations. Cultural differences and similarities, international politics, contemporary history and issues of human geography are also obvious topical areas that can be enriched by cross-cultural inquiry projects. Students can get first hand impressions on the human side of economical and political news, learn about norms of behavior, traditions and values in different cultures and explore norms and values in their own culture.

Organization and Management of an Instructional Network

The mere presence of a computer network does not create an educational environment. Having students hooked up to a network and telling them to "talk with each other" does not create a functional learning environment (see Levin & Riel, 1985). Students need a series of activities in which their interests converge so that they can expect relevant gains from such interaction. Teachers also need a clear understanding of how the networking could fit into their plans to achieve their educational goals. Thus, the issue of how to organize activities on the network is critical.

One feature of instructional networking like the Intercultural Learning Network is that it is flexible enough to accomodate both highly structured activities as well as activities with almost no preliminary structuring. The highly structured activities can provide sharp contrasts and similar implementation across sites. However, they also require tight coordination and uniformity. Less structured activities are easier to implement and more receptive to local adaptations. By arranging the activities in a continuum, participants in the network can choose activities more suitable for them at any specific point in time. Though successful activities on the network require parallel activities in at least at two different site, not all the participants have to start at the same time. The results of an activity at some sites can be stored for other sites to use at a later time.

One successful way for new participants to join the Intercultural Network is in a progressive manner, starting with projects that require loose coordination and that allow participants to set their own working schedules. Thus, for example, students and teachers that join the network for the first time can do so by writing articles for the Computer Chronicles and by creating an edition of the newspaper in their local area. When they have become accustomed to this new technology, they can participate in a project requiring more coordinated interaction. For example, a site can join any of the ongoing inquiry projects. Later, the site students can participate as team members in simulation games and in the design of new activities.

It is important to avoid overwhelming new participants by prematurely overexposing them to this new form of communication. Students and teachers must be given the opportunity to discover this form of interactional cultural exploration at their own pace. To facilitate diverse participation scenarios networks should be organized in such a way as to allow the development of a wide range of activities.

Network Support of Multiple Languages and Cultures

Linguistic differences are undoubtedly one of the crucial factors hindering intercultural cooperation. So, for example, the first round of messages received in Jerusalem from college students in San Diego and Japan were responded to after little encouragement. Subsequent messages and direct responses to previous messages remained unanswered for longer periods. The students' attitude about these messages was clearly in contrast to their continuous interest in the network activities as a

whole. We learned from discussion with the students that the main reason for this attitude was the language barrier: students were concerned about being misunderstood, or being perceived negatively due to their lack of mastery in English. To avoid this problem, students they were encouraged to write and revise their answers until the language level was felt appropriate enough. This process, however, required a greater effort than was reasonable for "small talk." A change in students' attitudes occured happened when they engaging in "serious work" in the form of research activities, and when university students started teaching the high school students to use computers. The students said that the importance of these activities "justified" the effort of working in English. They were interested both in the results of the research activities and in the high school students' reactions to computers and international networking.

The question of which language to use in the network was raised at a very early stage in the project, when only university researchers were exchanging ideas across the network. The first solution considered was to continue to use English, as the researchers were doing. Since in most of the countries English is learned as part of the regular curriculum, and since the software was designed in English, this solution seemed easy. However, this solution also raised the problem of "cultural imperialism." Not only were we introducing a new technology (computers and networking) but also forcing the participants to take advantage of it using a foreign language. This "cultural imperialism" was neither our goal, nor was it intrinsically necessary to achieve intercultural cooperation.

The next solution suggested was to use Esperanto. This choice was

rejected on various grounds: everybody would have to learn a new language, Esperanto would only be useful for this activity, many cultural inuendos would be lost, etc. The next solution offered was to provide translation as a service to the networking. This would be a costly solution in both time and money. Also, translators were bound to become "cultural interpreters," providing interpretations and adaptations of the original text for the receivers to understand.

For our pilot work we opted for a fourth solution: "receiving-end translation." Texts were created and forwarded in the local language of the participating site and were translated at the receiving end by bilingual students or other bilingual members of the community.

The rationale that guided us in addressing the language issue using "receiving-end translation" was based on providing an equal opportunity for students in the various locations to participate in the activities without being impaired by the need to do so in a foreign language. Nonetheless, when the participating teachers preferred to use the activities as context for foreign language teaching, they were able to do so.

Having the messages translated at the receiving end creates a situation in which bilingualism becomes an important resource in a functional environment. It also motivates students to learn the foreign language as a mean of communication. If no bilingual students are available in the school, students may look in their respective communities for people to help them translate. Also, they use the network itself to find help in translation.

Our experience in the Tijuana-Juneau-San Diego pilot project supported this analysis. The motivation to participate in the network, on the part of teachers and students in Tijuana became visibly stronger once they learned that they did not have to send articles in English. At the other end, students in Alaska and San Diego eagerly volunteered to translate, or find somebody who would translate, the incoming articles.

As the network expanded and the volume of communication increased, we found that the receiving-end translation was not sufficient. Many of the sites felt overwhelmed by the volume of foreign language messages. Presently we are exploring ways of providing computer "dictionary look-up assistance," to help students facilitate their cross-language comprehension of written materials. The basic idea of this lookup assistance, developed by Donald Gentner (Institute for Cognitive Science at UCSD), is to split the translation task between the computer and the student. The computer does the simple but tedious work of looking up each word in a dictionary. The student supplies world knowledge, context, syntax and semantics to identify the appropriate meaning of the message.

The original texts are run through a program that performs simple look-up and retrieval of equivalent words in one of the target languages from a bilingual dictionary. The dictionary contains several thousand of the most
frequent words in the language. Each retrieved word is printed one line above the original text. When several alternatives are found for a given word they are printed in successive vertical lines above the word. Spacing

between lines and between words on a line is provided to facilitate reading. The words from the target language are provided along with the original text. (Japanese words are presented with Roman characters. Hebrew words can be presented with Hebrew characters.) Part of a message from Tijuana students is shown below:

for medium
we much happy write with you by half of the net
Nos da mucho gusto podernos comunicar con ustedes por medio de la red

greeting whole
receive a loving health of all the student of
intercultural. Reciban un carinoso saludo de todos los estudiantes de ...

Another possibility that we are exploring involves dividing the assistance task between the computer and some bilingual person. After being run through the computer dictionary look-up (previously described), the processed messages are read by a bilingual expert who deletes any misleading alternatives retrieved by the program. We expect that the simple computer look-up procedure does facilitate the communication of main ideas. Combined with limited human assistance in the form of crossing out irrelevant and misleading computer retrievals, this process can enhance the efficiency of communication nearly to the level produced by by more costly full translation.

Based on our experiences, we conclude that it is feasible to carry

out educational activities across cultural and language boundaries. Various solutions to conceptual and technical challenges are possible without resorting to cultural or linguistic colonialism. Also very important is the fact that the language barrier has been turned into a problem solving situation for all the participants. Solutions have been proposed and tried by most of the sites. Probably the "ideal" solution to the language barrier will be one in which the task is divided among the sender, a computerized "dictionary look-up" program, bilingual revisers and the receiver. However, much in the same way as the activities are decided upon by the participants and tailored to their interests, the language bridging will be probably tailored to the specific needs of the participants and the activities.

Summary

The Intercultural Learning Network provides some powerful examples of the educational potential of international instructional networking. Because of continuing technological advances, crosscultural activities have become economically and technically feasible. The level of technical expertise needed is reasonably accessible to any motivated teacher. The continuing costs involved are small enough to be covered as incidental expenses by many school budgets. The educational potential of the activities is enormous. Some prototype activities have been developed to facilitate the initial interactions across cultures. Joint participation in such activities is a good way to encourage multilingualism and awareness to other cultures. We are currently conducting further research to evaluate the long term effects of international networking on students'

attitudes, knowledge and cultural awareness.

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